

IN THE CLAIMS:

Amend Claims 21-23, 25, 27, 29-32, 34-36, 38, 40, 44-49 and 52-55 as follows :

Claims 1-20. (Canceled).

21. (Currently amended) A device for detecting optical signals, comprising
- means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of
- (i) frequency shift or frequency modulation or both;
 - (ii) phase shift or phase modulation or both; and
 - (iii) time displacement,
- all (i)-(iii) relating to the optical signal to be detected;
- means (20, 30) structured and arranged for aligning at least one of the signals and reference light ray(s) such that they can be brought into interference; and
- a detector (40) with a demodulator (50) being structured and arranged to detect amplitude modulation of a resulting signal from said interference;
- wherein ~~a wavelength-dependent~~ an angular dispersive element (11, 12, 14) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength; and
- said detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity of at least part of cross-section of the resulting detected signal.
22. (Currently amended) A device for generating optical signals by modulation of optical carriers, comprising

means structured and arranged for generating at least one reference light ray which has at least one of

(i) frequency shift or frequency modulation or both;

(ii) phase shift or phase modulation or both; and

(iii) time displacement,

all (i)-(iii) relating to the optical signal to be modulated;

means structured and arranged for aligning ~~the~~ an optical signal carrier and at least one of the reference light ray(s) such that they can be brought into interference; and

a coupler structured and arranged to collect a resulting signal from said interference and ~~directs~~ direct the signal to ~~a further optical transmission line~~ where the resulting signal exhibits modulation;

wherein, ~~a wavelength-dependent~~ an angular dispersive element is structured and arranged to change angle(s) of at least one of the optical carrier and reference light ray(s) being brought into interference, depending upon wavelength; and

the device is structured and arranged to make the thus coupled-out signal dependent upon at least one of time (amplitude modulation) or spatial modulation of intensity with reference to at least part of cross-section of the resulting interference signal.

23. (Currently amended) A device in accordance with claim 22, wherein said generating means (10, 11, 20, 80) include a beam splitter and ~~of~~ a frequency shifter or modulator.

24. (Previously presented) A device in accordance with claim 21, wherein said

generating means (10, 11, 20, 80) include a local light source.

25. (Currently Amended) A device in accordance with claim 21, wherein said ~~wavelength-dependent~~ angular dispersive element (11, 12, 14) includes a diffracting optical element.

26. (Previously presented) A device in accordance with claim 25, wherein said diffracting optical element is at least one of an optical grating (11, 14), a hologram, or a system of thin films.

27. (Currently Amended) A device in accordance with claim 21, wherein the ~~wavelength-dependent~~ angular dispersive element (12) is a dispersing optical element.

28. (Previously presented) A device in accordance with claim 27, wherein said dispersing optical element is a prism (12).

29. (Currently Amended) A device in accordance with claim 21, wherein the ~~wavelength-dependent~~ angular dispersive element (11) is a beam splitter (11) or combiner.

30. (Currently amended) A device in accordance with claim 21, wherein the ~~wavelength-dependent~~ angular dispersive element (11, 12, 14) is structured and arranged to change type or degree of dependence of angle deflection by the wavelength.

31. (Currently Amended) A device in accordance with claim 21, wherein the ~~wavelength-dependent~~ angular dispersive element is simultaneously at least one of

- (a) a frequency shifter, or frequency modulator,
- (b) a phase shifter or phase modulator.

32. (Currently Amended) A device in accordance with claim 31, wherein the

~~wavelength-dependent~~ angular dispersive element is structured and arranged as an acousto-optical modulator.

33. (Previously presented) A device in accordance with claim 21, additionally comprising

means for deflecting at least one of the reference light ray and optical signal.

34. (Currently amended) A device for detecting optical signals, comprising means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of

(i) frequency shift or frequency modulation or both;

(ii) phase shift or phase modulation or both; and

(iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the optical signals and reference light ray(s) such that they can be brought into interference; and

a detector (40) with a demodulator (50) structured and arranged to detect amplitude modulation of a resulting signal from said interference;

wherein ~~a wavelength-dependent~~ an angular dispersive element (11, 12, 14) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength;

the detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity with reference to at least part of cross-section of the

resulting detected signal; and

the ~~wavelength-dependent~~ angular dispersive element (11, 12, 14) is structured and arranged to be at least one of rotatable or tiltable.

35.(Currently amended) A device for detecting optical signals, comprising

means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of

- (i) frequency shift or frequency modulation or both;
- (ii) phase shift or phase modulation or both; and
- (iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the optical signals and reference light ray(s) such that they can be brought into interference;

a detector (40) with a demodulator (50) structured and arranged to detect amplitude modulation of a resulting signal from said interference;

wherein a ~~wave-length-dependent~~ an angular dispersive element (11,12, 14) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon the wavelength;

the detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity with reference to at least a part of cross-section of the resulting detected signal; and

additionally comprising at least one of a multiplex hologram and other optical elements structured and arranged for simultaneously handling multiple rays.

36. (Currently amended) A device for detecting optical signals, comprising means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of

- (i) frequency shift or frequency modulation or both;
- (ii) phase shift or phase modulation or both; and
- (iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the optical signals and reference light ray(s) such that they can be brought into interference;

a detector (40) with a demodulator (50) structured and arranged to detect amplitude modulation of a resulting signal from said interference;

wherein ~~a wavelength-dependent~~ an angular dispersive element (11, 12, 14) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength,

the detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity with reference to at least part of cross-section of a resulting signal from said interference; and

said device being structured and arranged for handling multiple rays.

37. (Previously presented) The device in accordance with claim 36, additionally comprising

parts of said device being provided in multiple for handling the multiple rays.

38. (Currently amended) A device for detecting optical signals, comprising

means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of

- (i) frequency shift or frequency modulation or both;
- (ii) phase shift or phase modulation or both; and
- (iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the optical signals and reference light ray(s) such that they can be brought into interference; and

a detector (40) with a demodulator (50) structured and arranged to detect amplitude modulation of a resulting signal from said interference;

wherein ~~a wavelength-dependent~~ an angular dispersive element (11, 12, 14) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength;

of the detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity with reference to at least part of cross-section of the resulting detected signal; and

additionally comprising means structured and arranged for changing the ray cross-section of at least one of the rays involved.

39.(Previously presented) A device in accordance with claim 21, additionally comprising

means structured and arranged for providing at least one of spectral

filtration, and spatial modulation of

at least one of phase and amplitude of at least one of said rays involved.

40. (Currently amended) A device for detecting optical signals,
comprising

means (10, 11, 20, 80) structured and arranged for generating at least one
reference light ray which has at least one of

- (i) frequency shift or frequency modulation or both;
- (ii) phase shift or phase modulation or both; and
- (iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the
optical signals and reference light ray(s) such that they can be brought into
interference; and

a detector (40) with a demodulator (50) structured and arranged to detect
amplitude modulation of a resulting signal from said interference;

wherein ~~a wavelength-dependent~~ an angular dispersive element (11, 12, 14) is
structured and arranged to change angle(s) of at least one of the optical signals and
reference ray(s) being brought into interference depending upon wavelength;

a detector (40) is structured and arranged to measure at least one of time and
spatial modulation of intensity with reference to at least part of cross-section of the
resulting detected signal; and

additionally comprising at least one of (a) and (b):

- (a) wave guides structured and arranged such that at least part of the rays

involved are guided at least partially therethrough; and

(b) at least part of the ~~wavelength-dependent~~ angular dispersive element being formed by integrated optics.

41.(Previously Presented) A device in accordance with claim 21, which is an optical receiver or spectrometer.

42.(Previously presented) A device in accordance with claim 21, omitting a local oscillator.

43.(Previously presented) A device in accordance with claim 22, omitting a local oscillator.

44.(Currently Amended) ~~The A device in accordance with claim 21,~~
for detecting optical signals, comprising

means (10, 11, 20, 80) structured and arranged for generating at least one reference light ray which has at least one of

(i) frequency shift or frequency modulation or both;

(ii) phase shift or phase modulation or both; and

(iii) time displacement,

all (i)-(iii) relating to the optical signal to be detected;

means (20, 30) structured and arranged for aligning at least one of the signals and reference light ray(s) such that they can be brought into interference; and

a detector (40) with a demodulator (50) being structured and arranged to detect amplitude modulation of a resulting signal from said interference;

wherein a wavelength-dependent element (11, 12, 14) is

structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength;

said detector (40) is structured and arranged to measure at least one of time and spatial modulation of intensity of at least part of cross-section of the resulting detected signal;

structured and arranged for using a ray path of a Michelson interferometer, and comprising

a beam splitter (10),

a prism (12) structured and arranged as the wavelength dependent element,

a mirror (20) and means for shifting the same to constitute a phase modulator,

another mirror (30) pivotally provided to select the wavelength to be detected, the detector (40) structured and arranged to integrate intensity over the entire cross-section of the ray to be detected,

a lock-in amplifier as the demodulator (50), and

a modulator control (60) structured and arranged for controlling the first mirror (20) as the phase modulator.

45.(Currently amended) The device in accordance with claim 22, structured and arranged for using a ray path of a Michelson interferometer, and comprising

a beam splitter (10),

a prism (12) structured and arranged as the wavelength angular dispersive

dependent element,

a mirror (20) and means for shifting the same to constitute a phase

modulator,

another mirror (30) pivotally provided to select the wavelength to be ~~detected~~
modulated,

~~the detector (40) structured and arranged to integrate intensity over the entire
cross-section of the ray to be detected;~~

~~a lock-in amplifier as the demodulator (50); and~~

a modulator control (60) structured and arranged for controlling the first
mirror (20) as the phase modulator.

46.(Currently amended) The device in accordance with claim 22,
structured and arranged for using the ray path of a Mach-Zehnder interferometer, and
comprising

a first beam splitter (11) structured and arranged as a diffracting optical
element and forming the ~~wavelength-dependent~~ angular dispersive element,

a first mirror (20) and means for shifting the same to form a phase
modulator,

a second mirror (30) being pivotally mounted for selecting the wavelength to be
detected,

a second beam splitter (13) being structured and arranged as a combiner
for bringing partial rays into interference,

two detectors (40, 40') structured and arranged for detecting the
interference rays, to integrate the intensity over the whole cross-section of the detectors

in each case,

a lock-in amplifier with differential input constituting the demodulator (50)

and

a modular control (60) structured and arranged as said shifting means to control the first mirror (20) as the phase modulator.

47.(Currently amended) The device in accordance with claim 22, structured and arranged for using the ray path of a Mach-Zehnder interferometer, and comprising

a first beam splitter (11) structured and arranged as a diffracting optical element and forming the ~~wavelength-dependent~~ angular dispersive element,

a first mirror (20) and means for shifting the same to form a phase modulator,

a second mirror (30) being pivotally mounted for selecting the wavelength to be detected,

a second beam splitter (13) being structured and arranged as a combiner for bringing partial rays into interference,

two detectors (40, 40') structured and arranged for detecting the interference rays, to integrate the intensity over the whole cross-section of the detectors in each case,

a lock-in amplifier with differential input constituting the demodulator (50)

and

a modular control (60) structured and arranged as said shifting means to control the first mirror (20) as the phase modulator.

48.(Currently amended) A device in accordance with claim 21,
structured and arranged for detecting one of partial rays delayed in time, such that
there is a time shift between the reference and signal rays, comprising
means for providing the change in relative position between partial rays by
providing time displacement of one of the partial rays,
a glass fiber (70) structured and arranged for guiding of an incident signal
therethrough,
a first beam splitter (80) structured and arranged with glass fiber
technology and through which the incident signal is guided subsequent to said glass
fiber (70),
means for expanding one part of said signal,
a second beam splitter (13) through which said expanded signal is guided after
a short period,
a mirror (30) pivotally mounted for selecting wavelength to be detected
and guiding said expanded signal to said second beam splitter (13),
a travel distance (90) arranged for delaying the other part of the signal
having passed through said first beam splitter (80),
means for expanding said other delayed ray and guiding the same to
said second beam splitter (13),
a ~~wavelength-dependent~~ an angular dispersive element (14) structured and
arranged as a diffracting optical element for guiding said delayed and expanded ray to
said second beam splitter (13) along said travel distance (90),
said second beam splitter (13), structured and arranged as a combiner for

bringing said partial rays into interference with one another,

detectors (40, 40') structured and arranged for detecting said combined rays, to integrate the intensity over the entire cross-section of the ray to be detected in each case, and

said demodulator (50) being electronic and having a varying design depending upon modulation type of the signal.

49.(Currently amended) A device in accordance with claim 22, structured and arranged for detecting one of partial rays delayed in time, such that there is a time shift between the reference and signal rays, comprising

means for providing the change in relative position between partial rays by providing time displacement of one of the partial rays,

a glass fiber (70) structured and arranged for guiding of an incident signal therethrough,

a first beam splitter (80) structured and arranged with glass fiber technology and through which the incident signal is guided subsequent to said glass fiber (70),

means for expanding one part of said signal,

a second beam splitter (13) through which said expanded signal is guided after a short period,

a mirror (30) pivotally mounted for selecting wavelength to be detected and guiding said expanded signal to said second beam splitter (13),

a travel distance (90) arranged for delaying the other part of the signal having passed through said first beam splitter (80),

means for expanding said other delayed ray and guiding the same to said second beam splitter (13),

~~a wavelength-dependent~~ an angular dispersive element (14) structured and arranged as a diffracting optical element for guiding said delayed and expanded ray to second beam splitter (13) along said travel distance (90),

said second beam splitter (13), structured and arranged as a combiner for bringing said partial rays into interference with one another,

detectors (40, 40') structured and arranged for detecting said combined rays, to integrate the intensity over the entire cross-section of the ray to be detected in each case, and

said demodulator (50) being electronic and having a varying design depending upon modulation type of the signal.

50. (Previously Presented) A device for detecting or generating optical signals, comprising

a source of a reference light ray,

a beam splitter (10) positioned downstream of said source to receive the reference light ray and split the same into two partial rays,

a prism (12) arranged on a side of the beam splitter (10) and as a wavelength-dependent element,

a first mirror (20) arranged on a side of said beam splitter (10) opposite said incoming reference ray,

means for shifting the first mirror (20) to serve as a phase modulator in reflecting a beam back the beam splitter (10),

a second mirror (30) pivotally arranged on a side of said prism (12) opposite said beam splitter (10) to reflect back and select wavelength of a signal to be detected,

a detector (40) arranged on a side of said beam splitter (10) opposite said prism (12), said detector integrating intensity over a whole cross-section of the ray to be detected,

a lock-in amplifier arranged as a demodulator (50) and coupled to said detector (40), and

a modulator control (60) coupled to both said demodulator (50) and first mirror (20) to act as said shifting means to control the first mirror (20) as the phase modulator.

51. (Previously Presented) A device for detecting or generating optical signals, comprising

a source of a reference light ray,

a first beam splitter (11) arranged downstream of said source to split the light ray into two partial rays, said first beam splitter (11) arranged as a diffracting element and wavelength dependent element,

a first mirror (20) arranged downstream of said first beam splitter (10) on a side thereof opposite said incoming rays

means for shifting the first mirror(20) to reflect and phase modulate a first one of said partial rays,

a second mirror (30) pivotally positioned downstream of said beam splitter (11) to reflect a second one of said partial rays and select wavelength of the ray to be detected,

a second beam splitter (13) arranged downstream of said first (20) and second

(30) mirrors to combine the partial rays in interference,

two separate detectors (40,40') arranged downstream of said second beam splitter (13) on a side thereof opposite said incoming partial rays, each said detector (40, 40') integrating intensity over an entire cross-section of a respective ray being detected,

a lock-in amplifier arranged as a demodulator (50) and coupled to each said detector (40, 40'), and

a modulator control (60) coupled to both said demodulator (50) and first mirror (20) to act as said shifting means to control the first mirror (20) as the phase modulator.

52. (Currently amended) A device for detecting or generating an optical signal, comprising

a source of a reference light ray,

a glass fiber (70) arranged to receive and guide an incident signal of the ray therethrough,

a first beam splitter (80) being positioned downstream of said fiber (70) from said incident signal and comprising glass fiber technology to split the incident signal into two partial signals,

first means for expanding a first one of said partial signals and positioned downstream of said first beam splitter (80),

a mirror (30) positioned downstream of said first expanding means and pivotally arranged to select wavelength of said first partial signal to be detected,

a travel distance (90) arranged downstream of said first beam splitter (80) for receiving and delaying a second one of said partial signals,

second means for expanding the second one of said partial signals after passing along said travel distance (90),

~~a wave length dependent~~ an angular dispersive element (14) positioned downstream of said second expanding means,

a second beam splitter (13) arranged downstream of said mirror (30) and ~~wavelength dependent~~ angular dispersive element (14), to combine said partial signals in interference,

two separate detectors (40, 40') arranged downstream of said second beam splitter (13) on a side thereof opposite said incoming partial signals, each said detector (40,40') integrating intensity over an entire cross-section of a respective signal being detected, and

a demodulator (50) coupled to both said separate detectors (40,40').

53.(Currently Amended) A device in accordance with claim 21 ~~21~~ 22, which is an optical modulator.

54.(Currently Amended) A device in accordance with claim 21, wherein said device is structured and arranged to receive a wavelength-division multiplexed (WDM) communication signal carrying phase-modulated or frequency-modulated data, said WDM communication signal further comprising a plurality of communication channels, each of said ~~channel designating~~ channels designated by a respective wavelength;

said device is structured and arranged to allow heterodyne detection of a single optical channel with defined wavelength without spatial separation from other optical channels of different wavelength; and

said detector (40) with a demodulator (50) being structured and arranged to demodulate data from the detected channel.

55.(Currently Amended) The device in accordance with claim 21, comprising, in combination

an interferometer as said means ~~(20, 30)~~ structured and arranged for generating at least one reference light ray,

means ~~(60 20)~~ for modulating one of the rays brought to ~~superposition~~ interference,

heterodyne detection means constituting said detector (40), and

said ~~spectrally~~ angular dispersive element (11, 12, 14) structured and arranged to change angle(s) of rays inside the interferometer (20, 30) according to wavelength of the rays.